REMARKS

This communication is responsive to the Office Action of April 5, 2006 in which the following objections were raised: [2-3] Claims 1, 5, 9, 17 were rejected under 35 U.S.C. 102(e) as being anticipated by Czerwiec et al. (USP 6,314,102); [4-5] Claims 2,3,7 were rejected under 35 U.S.C. 103(a) as unpatentable over Czerwiec et al. (US 6,314,102) in view of Rybicki et al. (US 5,742,527) in further view of Bloy et al. (US 4,695,825); and [6] Claims 4 and 6 were rejected under 35 U.S.C. 103(a) as being unpatentable over Czerwiec et al. (US 6,314,102) in view of Bloy et al. (US 4,695,825).

Applicant has amended Claims 1,2, 3, 6, 7 and 17.

2-3   CLAIMS 1, 5, 9, 17 REJECTED UNDER 35 U.S.C. 102(e)

Claims 1, 5, 9, 17 were rejected under 35 U.S.C. 102(e) as being anticipated by Czerwiec et al. (USP 6,314,102). The Examiner has characterized the Czerwiec reference as teaching an X-DSL transceiver in which the tone spacing of the multi-tone modulation and demodulation is varied to conform with the available bandwidth on the at least one subscriber line. The Applicant respectfully rejects that characterization of the Czerwiec reference.

The Czerwiec reference teaches a subscriber access multiplexer for handling narrowband public switched telephone network traffic (PSTN) as well as broadband XDSL traffic. "*As shown in FIG. 12, for example, the power spectrum is shown as including a 4 KHz band reserved for POTS (narrowband) service, with the portion of the spectrum between about 40 KHz and 1.1 MHz occupied by a large plurality of carriers, with tone spacing of 4.3125 KHz for [broadband] bandband / wideband services. A small portion of the spectrum is used for upstream data, as shown, with the remainder used for downstream data. Each of the 4 KHz tones is QAM-modulated and individually selected and optimized as a function of individual subscriber line characteristics. Some tones are allocated with a large number of bits, while others a lesser number or none at all, due to line conditions.*" (Czerwiec at Col. 19, lines 48-60, emphasis added). Czerwiec teaches that the 'broadband' service can be delivered using either carrierless amplitude phase modulation (CAP) or discrete multi-tone modulation (DMT), and that in the latter case the tone spacing is

4.3125 KHz as stated above. There is no teaching or suggestion that the tone spacing can or could be varied. Czerwiec refers to varying the bit loading on each tone. The Applicant notes that variations in bit loading are part of various DMT XDSL standards, such as the ADSL standard, which Czerwiec appears to conform to. "*In the ADSL system, a DMT approach may be followed in which, for example, up to two hundred fifty-six carrier frequencies can be used (see FIG. 12). Each of these frequencies will carry a number of bits according to a mapping table.*" (Czerwiec at col. 18, lines 9-12) These variations in bit loading between tones are related to signal to noise ratios on each tone as determined by line conditions. In the Czerwiec reference all tones whether amenable to high or low bit loading have the same tone spacing despite variations in bit loading.

All the Applicant's Amended Independent Claims include the limitation of either method or apparatus for varying tone spacing to correspond with line conditions as follows:

> "*a Fourier transform module for transforming successive tone sets ... between a frequency domain and a time domain, and the Fourier transform module responsive to the determination to <u>expand the tone spacing by decreasing a processing interval associated with the transformation of each successive tone set between the time and frequency domains</u> and further responsive to the determination to <u>contract the tone spacing by increasing the processing interval associated with the transformation of each successive tone set between the time and frequency domains</u>, whereby the tone spacing utilized for modulation and demodulation of a fixed number of tones of the at least one multi-tone modulated communication channel varies at least in part based on a length of the at least one subscriber line.*" *(Applicant's amended Independent Claim 1, emphasis added)*

> "*...transforming successive tone sets of the at least one multi-tone modulated communication channel between a frequency domain and a time domain;*
>
> *responding to the selection of an <u>expanded tone spacing</u> in the selecting act by <u>decreasing a processing interval associated with the transformation</u> of each successive tone set <u>between the time and frequency domains;</u> and*

responding to the selection of a <u>contracted tone spacing</u> in the selecting act by <u>increasing a processing interval associated with the transformation</u> of each successive tone set <u>between the time and frequency domains</u>, whereby the tone spacing utilized for modulation and demodulation of a fixed number of tones of the at least one multi-tone modulated communication channel varies at least in part based on a length of the at least one subscriber line. " (Applicant's Amended Independent Claim 17, emphasis added)

Nowhere in the Czerwiec specification is there any apparatus or corresponding method for varying tone spacing in a DMT modulated transceiver which limitation is found in both Applicant's amended Independent Claims 1 and 17. The Applicant therefore respectfully requests that the Examiner withdraw the rejection of these Claims. Remaining rejected Claims 5 and 9 are dependent Claims from amended Independent Claim 1 and are thus also believed to have been amended to overcome the Czerwiec reference for the reasons discussed above and for other reasons of independent significance. The Applicant therefore respectfully requests that the Examiner withdraw the rejection of these Claims as well.

4-5   CLAIMS 2, 3, 7 REJECTED UNDER 35 U.S.C. 103(a)

Claims 2,3,7 were rejected under 35 U.S.C. 103(a) as unpatentable over Czerwiec et al. (US 6,314,102) in view of Rybicki et al. (US 5,742,527) in further view of Bloy et al. (US 4,695,825). The Examiner characterizes the Czerwiec and Rybicki references as failing to disclose the "interval relationship of the tone set." (Office Action of 4-5-2006 at page 5). The Applicant concurs with that characterization. The Examiner further indicates that the Bloy reference supplies the missing teaching. The Applicant respectfully rejects this characterization.

The Bloy reference, entitled "Analog-Digital Conversion System" teaches an A/D converter. As the Examiner has stated, and as Applicant concurs, the Bloy reference characterizes the A/D converter as having reduced cycle times and hence enhanced bandwidth. Increasing or decreasing the bandwidth of an A/D converter however, will not affect the tone spacing of tones in a DMT modulated transceiver, rather it may in the extremes have the effect of reducing or increasing the number of tones that can be processed. Thus the Bloy reference fails to supply the required teaching or disclosure of either method or

apparatus for varying tone spacing in a DMT modulated transceiver which limitation is found in Applicant's amended Independent Claim 1 and by extension in Claims 2, 3 and 7 dependent there from.   The Applicant therefore respectfully requests that the Examiner withdraw the rejection of these Claims both for the reasons discussed above in connection with amended Independent Claim 1 from which they depend as well as for the additional reasons discussed in this section.

6   CLAIMS 4 and 6 REJECTED UNDER 35 U.S.C. 103(a)

Claims 4 and 6 were rejected under 35 U.S.C. 103(a) as being unpatentable over Czerwiec et al. (US 6,314,102) in view of Bloy et al. (US 4,695,825).

The Examiner characterizes the Czerwiec reference as failing to disclose the "interval of bandwidth in the DSP." (Office Action of 4-5-2006 at page 7). The Applicant concurs with that characterization. The Examiner further indicates that the Bloy reference supplies the missing teaching. The Applicant respectfully rejects this characterization.

The Bloy reference, entitled "Analog-Digital Conversion System" teaches an A/D converter. As the Examiner has stated, and as Applicant concurs, the Bloy reference characterizes the A/D converter as having reduced cycle times and hence enhanced bandwidth. Increasing or decreasing the bandwidth of an A/D converter however, will not affect the tone spacing of tones in a DMT modulated transceiver, rather it may in the extremes have the effect of reducing or increasing the number of tones that can be processed. Thus the Bloy reference fails to supply the required teaching or disclosure of either method or apparatus for varying tone spacing in a DMT modulated transceiver which limitation is found in Applicant's amended Independent Claim 1 and by extension in Claims 4 and 6 dependent there from.   The Applicant therefore respectfully requests that the Examiner withdraw the rejection of these Claims both for the reasons discussed above in connection with amended Independent Claim 1 from which they depend as well as for the additional reasons discussed in this section.

AMENDMENTS ARE SUPPORTED

The Applicant's claimed limitations including the amendments to Independent Claims 1 and 17 are supported throughout the Application including: Figures 3A, 3B, 4A, 4B, 5, 6A-6D, and FIG. 7 and the associated Specification including the following: *"Where a specific channel loop qualifies for expanded tone spacing and concomitant higher data rates the IDFT implements these rates by periodically generating a tone set in an interval which is an integer fraction of that called for by the standard. Where the processing periodicity for successive coefficient sets is ½ the standard or 125 micro seconds the tone spacing expands to 8.625 kHz. (See FIG. 3B). This allows the same IDFT engine with the same sample size, the same number of tones, to provide up to twice the upstream bandwidth. Other channels which do not qualify for higher data rates have their coefficient sets transformed into tone sets at the 250 micro second interval called for by the standard. The DFT engine 204 and the IDFT engine 220 collectively form an IDFT/DFT engine which may be implemented in hardware, firmware or software. "* (Applicant's Specification at Page 11, lines 17-27, emphasis added). *"In decision process 706 a determination is made for both the CO and subscriber modem units as to whether expanded tone spacing is supported. If expanded tone sets are supported control passes to process 708. In process 708 the spacing of the expanded tone set is established by setting the processing interval for each of the symbol/tone sets for that channel at an integer fraction or multiple of the standard processing interval of 250 microseconds. Control then passes to process 710 in which the training for the channel is effected. Then in process 712 the channel is characterized for each tone in the tone set. Next in decision process 714 a determination is made as to whether the subscriber loop which carries the channel qualifies for high data rates associated with an expanded tone spacing. If not control passes to process 720. If the channel's subscriber line loop qualifies as a short haul line/channel which supports the expanded tone spacing then control passes to process 730 in which state information is exchanged between the CO and subscriber modems."* (Applicant's Specification at page 18, lines 6-18) *" FIGS. 3 A-B are signal diagrams showing a common set of DMT tones with a standard tone spacing 300 of 4.3125 kHz (See FIG. 3A) and an expanded tone spacing of 8.625 kHz (See FIG. 3B). The variation in tone spacing is achieved by varying the processing periodicity for successive symbol/tone sets from the X-DSL standard of 250 microseconds per symbol per tone set to 125 microseconds per symbol per tone set for each channel. "* (Applicant's Specification at page 14, lines 3-8)

CONCLUSION

In view of the above remarks, and the amendments to the Claims, Applicant respectfully submits that all remaining Claims 1-7, 9 and 17 have been placed in a condition for allowance, and requests that they be allowed. Early notice to this effect is solicited.

The Commissioner is authorized to charge any additional fees which may be required, including petition fees and extension of time fees, to Deposit Account No. 50-1338 (Docket No. **VELCP010X1**).

Respectfully submitted,

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Date: October 5, 2006

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